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strictly to my determination to collect only fruiting specimens, and did not recognize any of the mosses at the time I collected them. Second, I find it here, in "Hills and Dales," just outside of the city limits of Dayton, sparsely scattered over a very limited area, growing on clay and limestone, on the steep sides of gullies and banks of brooks, in open deciduous woods. All I have found here has been within a tract less than one-half mile square, all sterile.

Sulphur Lick Springs, is about fifty miles southeast of Dayton, and about nine miles west of Chillicothe. Both stations present about the same physical conditions. Dayton station is about nine hundred feet above sea level, while the country around Sulphur Lick Springs ranges between one thousand and twelve hundred feet above the sea. Both are in the same geologic horizon, the Upper Silurian, and both are covered with heavy deposits of glacial drift, and with the same type of forest growth.

H. S. JEWETT, M.D.

DAYTON, Ohio.

REVIEWS

INTER-RELATIONSHIPS OF THE BRYOPHYTA

BY DR. FRANK CAVERS

Some months ago the Editor received a complimentary copy of the above pamphlet for review, but a desire for a more complete and thorough examination of the work has delayed the matter until an apology is due Dr. Cavers.

The pamphlet of 210 pp., 6"x9¾", illustrated by 72 figures in the text is a thoughtful and suggestive contribution to the subject indicated by its title. With some exceptions the classification adopted in the *Pflanzenfamilien* of Engler and Prantl are followed.

The *Hepaticæ* including the *Anthocerotales* occupy 151 pages, making a pretty complete survey of that subdivision of the "Bryophyta." Because of their great variety of structure and the perplexing nature of their relationships, 65 pages are given to the comparatively small groups *Sphærocarpales* and *Marchantiales*.

Dr. Cavers does not accept Howe's view that the *Anthocerotales* are worthy of being elevated to the rank of a class co-ordinate with *Hepaticeæ* and disposes of the main distinction on which Howe bases his view, *i. e.* "(i) A single large chloroplast to each cell, instead of several smaller chloroplasts as in the assimilative tissues of the *Hepaticæ* proper; (ii) the antheridia arise within the thallus—are endogenous in origin—and the walls of the immersed archegonia are confluent with the adjacent tissues; (iii) the presence of meristematic tissue in the capsule near its base, by the activity of which the capsule has a long continued growth, ripening spores towards its apex while forming new spore-mother-cells below; (iv) the presence, in probably all cases, of a columella around which the archesporium is formed; (v) the presence, in many cases, of stomata on the capsule, with accompanying assimilative tissue,"—in the following manner, "From the summary presented here, it will be seen that very little importance can be attached to the first and second of the characters mentioned above. The number of chloroplasts *per* cell varies considerably. The 'endogenous' origin of the antheridia is obviously a secondary charcter, derived from the normal exogenous type of antheridium development; the antheridia themselves agree closely with those of other *Hepaticæ*, especially *Sphærocarpales*, and though the development of the antheridial cavity is peculiar, it is easier to relate it to what is found in other *Hepaticæ* than to establish analogies with the *Pteridophyta*. In the immersion of the archegonium in the thallus, the *Anthocerotales* do not in reality differ widely from other *Hepaticæ;* the archegonium is partly embedded in *Aneura*, though in this case, the neck is free. The meristematic tissue above the haustorium of the sporogonium in *Anthocerotales* evidently results from the persistence of a stage which is quickly passed through in the development of the sporogonium in other *Hepaticæ*. In *Pellia*, for instance, the cells of the seta are arranged in regular longitudinal rows, owing to repeated transverse divisions in the cells between haustorium and capsule, and we may imagine the sporogonium of the Anthocerotales to have arisen through the persistence of the meristematic activity of this zone of tissue, the differentiation of the capsule being deferred and becoming basipetal, instead of taking place early and being simultaneous. The columella of the Anthocerotean capsule, again, may be compared with the incomplete sterilization of central tissue which results in the formation of the elaterophore of such forms as *Pellia*, *Aneura*, and *Gottschea splachnophylla*. It is doubtful whether much stress should be laid on the presence of stomata in the epidermis of the Anthoceros capsule; this feature is doubtless to be correlated with the development of a many-layered capsule wall consisting of assimilative parenchyma. In various *Jungermanniales*, the capsule wall is many-layered, and when young contains chloroplasts—a condition which persists in the *Anthocerotales*, but is also found in the ripe capsules of forms like *Riella*, where the cells of the capsule wall do not become thickened with fibres in connection with a special dehiscence mechanism."

Dr. Cavers does not believe that the *Sphagnales* any more than the *Anthocerotales* should be given co-ordinate rank with *Musci* and *Hepaticeæ*, but suggests that if any departure from the customary division into *Hepaticeæ* and *Musci* is to be made, it will be more satisfactory to divide the Bryophytes as a whole into 10 groups of co-ordinate rank as given below,

Sphærocarpales.
Marchantiales.
Jungermanniales.
Anthocerotales.
Andreæales.

Sphagnales.
Tetraphidales.
Polytrichales.
Buxbaumiales.
Eu-Bryales.

Dr. Caver's treatment of the *Musci* is much less satisfactory to the Editor than that of the *Hepaticeæ*. His statement that the old distinction of *Acrocarpi* and *Plurocarpi* must be abandoned for many reasons, one of which is that "Many *pleurocarpous* forms occur among such *acrocarpus* families and genera as *Leucobryaceæ, Fissidens, Pleuroweisia*, etc." has much force, but when he says "A line may be traced, for instance, from the acrocarpous *Orthotrichaceæ* through intermediate forms like the *Hedwigiaceæ* and *Cryphæaceæ* to such typically pleurocarpous forms as *Eurhynchium* and *Hylocomium*" most moss students will be unable to perceive the accuracy of the statement, unless the steps are more numerous than indicated.

The work is well worth the attention of every student of the relationships and classification of the Bryophytes and its quite full bibliography will be of aid in selecting other literature along the same line.

THE BRYOLOGICAL COLLECTIONS OF DR. EMILIO LEVIER

A brief notice of the death of Dr. Levier appeared in the last BRYOLOGIST. His collections of mosses and hepatics are for sale and Mme. Levier has sent me a list of the names of the collectors and the places where they collected and states that the herbarium is estimated to contain 47,000 specimens, in 483 genera, and 12,372 species. Of these, 8,836 are mosses and 3,536 are hepatics. They are unmounted and contained in 120 packages with about 15 others which have not been incorporated. It is a large and a valuable collection. Lists may be had on application to me, also lists of his books for sale.

ELIZABETH G BRITTON.

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SULLIVANT MOSS SOCIETY

President's Report

Although the president has played but a small part in furthering the aims of the Sullivant Moss Society during the past year, he is able to report progress and a continued interest in the work on the part of the members. He still recommends the careful collection of material, even in regions which have been more or less explored, and is encouraged by the work of this character which has already been done. The study of variation under different environmental conditions is another field in which valuable results may be expected.

The following year will mark a number of changes in the Advisory Board of the Society, Mrs. Annie Morrill Smith becoming Vice-President in place of Miss C. C. Haynes, Mr. E. B. Chamberlain succeeding Mrs. Smith, as Treasurer,